

From: Lorraine White
To: Docket Optical System
Date: 6/28/2007 11:59 AM
Subject: Fwd: Cost and capacity factor predictions for Wave Energy conversion
Attachments: CEC Page1.JPG; CEC Page2.JPG

CC: Anitha Rednam
Please docket the attached as part of the 06-IEP-1k

>>> "Mirko Previsic" <mirko@re-vision.net> 6/20/2007 3:31 PM >>>
Anitha,

The wave energy cost numbers that were recently published by the CEC, seem to be largely off base. The report references Navigant Consulting as the data source for the data, who in turn lists the Oregon EPRI design report and an Interview with Roger Bedard as the data source for costing data (see attached 2 pages). I actually was the one that did the technical, cost and economic work on this particular study that is referenced here and I am a bit suprised at how anyone could miss-interpret these numbers as I think my report is pretty concise. For a complete reference please go to:
http://www.epri.com/oceanenergy/attachments/wave/reports/006_Oregon_System_Level_Design_RB_11-29-04.pdf

I am not sure where both the cost and capacity number data came from. The EPRI Oregon report I wrote in 2004 shows an installed cost of \$235 million for a 90MW wave farm (\$2600/kW) and a installed cost for a single unit of \$4.6 million (costs given in 2004 dollars). If I'd re-calibrate my costing model based on Today's data, I would probably come out at >\$3000/kW for the commercial plant and at about \$6M for the single unit based on updated numbers of actually building these units (reflecting increased raw material cost etc.). All costs refer to the OPD Pelamis unit, which may or may not applicable to other technologies.

As for capacity factor, the report states that the commercial plant has:

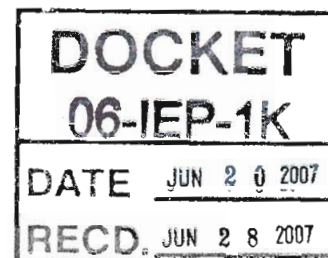
Capacity per unit: 500kW

Average Electrical output at busbar: 191kW

Calculated Net Capacity Factor: 38.2%

I am not sure where the stated 15% capacity factor came from. The only thing I can think of is that when I looked at the extractable potential for wave energy conversion shemes for the CEC, I came up that different schemes had an average wave to wire power conversion efficiency of 9%-30% depending on technology selected and then stated that a reasonable number would be 15% to estimate the technically extractable potential for the State of California. This had nothing to do with a capacity factor, but refers to how much of the primary resource could realistically be extracted using available technology Today and is largely driven by how closely together these devices can be placed (i.e. array internal spacing).

I look forward to a revised report.



Thank you,

Mirko

Mirko Previsic

re vision consulting LLC

Ph: ++1 916 977 3970

Email: mirko@re-vision.net

Supporting visionary renewable energy projects

Economic Assumptions: Wave Energy Conversion

	Wave Energy Conversion Economic Assumptions for Given Year of Installation (2006\$)	
	2006	Notes
Plant Capacity (MW)	.75	The 2006 number assumes a small 750 kW pilot plant.
Project Life (yrs)	20	From Navigant Consulting sources and estimates.
Overnight Installed Cost (\$/kW)	\$6,970	Assumes 82% progress ratio with worldwide production capacities of 100 MW in 2010.
Transmission and undersea cables	\$1,340	From Navigant Consulting sources and estimates.
Equipment	\$4,000	
Facilities	0	
Installation	\$990	
Construction Management and Permitting	\$640	
Fixed O&M (\$/kW-yr)	\$30	
Non-Fuel Variable O&M (\$/MWh)	\$25	

Sources: Navigant Consulting Estimates 2007, System Level Design, Performance and Costs – Oregon State Offshore Wave Power Plant - EPRI 2004, Interview with Roger Bedard of EPRI February 2007

Performance Data: Wave Energy Conversion

Wave Energy Conversion Economic Assumptions for Given Year of Installation (2006\$)		
	2006	Notes
Typical Net Capacity Factor (%)	15%	Capacity factors will vary with site conditions.
Fuel Cost (\$/MMBtu)	n/a	
Heat Rate (HHV)	n/a	
HHV Efficiency (%)	n/a	
Annual Output Degradation (%/yr)	1%	From Navigant Consulting sources and estimates.
CO ₂ (lb/MWh)	0	Wave energy conversion technologies have no emissions.
NO _x (lb/MWh)	0	
SO _x (lb/MWh)	0	

Sources: Navigant Consulting Estimates 2007, System Level Design, Performance and Costs – Oregon State Offshore Wave Power Plant - EPRI 2004, Interview with Roger Bedard of EPRI February 2007